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TRAINING CONSIDERATIONS IN SUPPORT OF REFURBISHMENT OF DEVICE 2--ETC(U)
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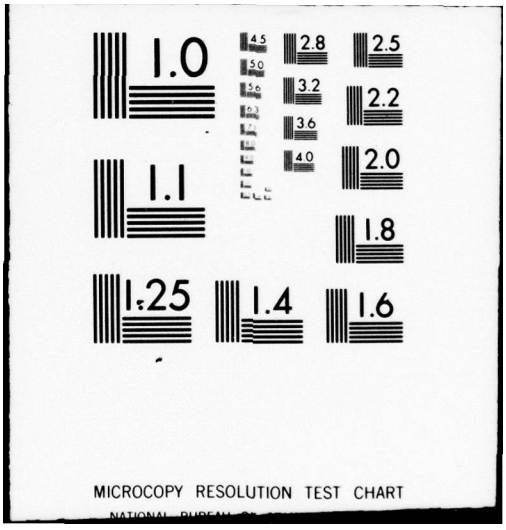
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Technical Note: NAVTRAEQUIPCEN TN-60

TRAINING CONSIDERATIONS IN SUPPORT OF REFURBISHMENT OF DEVICE 2F69D FOR THE NAVAL RESERVE

Leonard Ryan, John Smith, and Diane Planert
Plans, Program and Analysis Department
Naval Training Equipment Center
Orlando, Florida 32813

FINAL REPORT

June 1979

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June 1979

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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: NAVTRAEQUIPCEN TN-60	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): TRAINING CONSIDERATIONS IN SUPPORT OF REFURBISHMENT OF DEVICE 2F69D FOR THE NAVAL RESERVE	5. TYPE OF REPORT & PERIOD COVERED: Final Report, 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Leonard E. Ryan, John Smith, and Diane Planert	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Plans, Programs and Analysis Dept (N-82) Naval Training Equipment Center Orlando, FL 32813	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: NAVTRAEQUIPCEN Task No. WA4130PI
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE: June 1979; 13. NUMBER OF PAGES: 48
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): 51p.	15. SECURITY CLASS. (of this report): Unclassified; 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

NAVTRAEQUIPC-TN-60

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

P-3 aircraft training
OFTs
Simulator requirements
Training requirements
Device 2F69D
Device 2F87F
Simulator substitution

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared in response to a NAVAIRSYSCOM task to initiate a study covering various possible degrees of refurbishing Device 2F69D which is scheduled for transfer to the Naval Reserve at NAS Willow Grove, Pennsylvania.

Specific study objectives were to determine the following: (over)

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (continued)

- the overall NAVRES/NAVRESASWTAC P-3 A/B training pipeline;
- specific pilot, copilot, and flight engineer training requirements;
- functional systems of the 2F69D OFT required to support identified training requirements;
- refurbishment/overhaul priority considerations of 2F69D OFT functional systems based on their overall contribution to training;
- alternative methods/media to support the NAVRES training program; e.g., cockpit procedure trainer and/or Device 2F87F (P-3 OFT); and
- 2F69D maintenance and logistic personnel support requirements.

The recommendation in this report is to transfer Device 2F69D OFT from Brunswick, Maine, in an "as is" condition, and initiate procurement of a new Device 2F87F. Cost savings based on flight hour reductions are discussed.

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ACKNOWLEDGMENTS

The collection of information presented in this report was greatly facilitated by the cooperation and dedication of the Commander and training staff of the NAVRES ASWTAC school at NAS Willow Grove. Their support of the requirements survey was invaluable to preparation of this report.

Appreciation is owed to James J. Riley of the NAVTRAEQUIPCEN for his technical assistance and storehouse of knowledge regarding the history of Device 2F69D. Dr. William M. Swope, Paul G. Scott, and Robert F. Browning of the Training Analysis and Evaluation Group provided valuable inputs regarding cost data, and William T. Harris of the NAVTRAEQUIPCEN contributed much time sorting out functional simulation requirements.

SUMMARY

This report was prepared in response to a NAVAIRSYSCOM task to initiate a study covering various possible degrees of refurbishing Device 2F69D which is scheduled for transfer to the Naval Reserve at NAS Willow Grove, Pennsylvania.

The study team visited the RESASWTAC school at NAS Willow Grove and was briefed on the training program of RESASWTAC and the Reserve squadrons. Training tasks based on the existing squadron syllabus were used as a basis for RESASWTAC training tasks. These tasks were compared with NATOPS normal and emergency procedures to determine the aircraft equipment involved in each task. This process provided a list of OFT equipment necessary to train the tasks.

Based on the training tasks and the training device requirements, alternative media and associated cost factors were investigated. Consideration was given to the following: (1) Convert 2F69D to a CPT-level device, (2) transfer the 2F69D "as is" and attempt improved maintenance/logistics support, (3) overhaul/refurbish required existing components (without digital upgrade), (4) overhaul/refurbish required existing components and digitally upgrade the NAVAIDS capability, and (5) procure a new digital 2F87F. The recommended option from the five alternatives considered was to combine alternatives (2) and (5); i.e., transfer the Brunswick 2F69D to Willow Grove "as is" and procure a device 2F87F for follow-on training.

Cost savings based on flight hour reductions are also discussed.

SECTION I

INTRODUCTION

In the 1st quarter FY 80, the P-3 A/B OFT, Device 2F69D, currently located at NAS Brunswick, Maine, is scheduled to be transferred to RESASWTAC, NAS Willow Grove, Pennsylvania. The tactics portion of the 2F69D will be modified to reflect updated operational equipment and will be transferred to RESASWTAC during the 2nd quarter FY 80. RESASWTAC expects to use the 2F69D WST for training purposes through the 1980s.

The 2F69D OFT has been in use approximately 13 years and has never undergone a comprehensive refurbishment. In its present condition, the device provides unrealistic flight characteristics and has numerous maintenance problems. The Chief of Naval Reserve (CNAVRES) has expressed concern about the condition of the device and also about logistics/supply support problems associated with the device. These problems were addressed recently in a meeting of the P-3 Integrated Logistics Support Team (ILSMT). The minutes of the ILSMT meeting state that "Unless a general update/refurbishment of the OFT is conducted upon transfer to the Reserves, the OFT will not be maintainable and hence of little training value."

To resolve these problems, NAVAIRSYSCOM has tasked NAVTRAEQUIPCEN to initiate a study covering various possible degrees of refurbishment and the associated cost.

PURPOSE

The purpose of this report, in conjunction with engineering cost and logistics data to be provided separately by Code N-412,

is to provide the NAVTRAEQUIPCEN Project Director with information needed to determine the extent to which 2F69D OFT refurbishment/ overhaul is required and justified in terms of NAVRES P-3 A/B training requirements and available resources. Specific objectives of the study were to determine the following:

- the overall NAVRES/NAVRESASWTAC P-3 A/B training pipeline
- specific pilot, copilot, and flight engineer training requirements
- functional systems of the 2F69D OFT required to support identified training requirements
- refurbishment/overhaul priority considerations of 2F69D OFT functional systems based on their overall contribution to training
- alternative methods/media to support the NAVRES training program; e.g., cockpit procedure trainer and/or Device 2F87F (P-3 OFT)
- 2F69D maintenance and logistic personnel support requirements.

METHOD

NAVRES P-3 A/B OFT training requirements data were obtained from experienced instructor pilot and flight engineer personnel during a 4-day visit to the RESASWTAC School located at NAS Willow Grove, Pennsylvania. At the time of the visit, a training curriculum had not been prepared and specific training objectives were not available; however, the school's instructor and NATOP's

personnel had previously developed plans for the use of the OFT and devoted four full days briefing the NAVTRAEQUIPCEN analysis team on their plans and requirements. The planned utilization corresponded closely to the present Reserve Force Squadron (RESFORON) squadron/unit OFT syllabus.

To ensure that all required pilot and flight engineer OFT capabilities were systematically analyzed and documented, the P-3 A/B NATOPS (NAVAIR 01-75PAA-1) was used as a basis for data collection. NATOPS presents all approved operating procedures for the pilot, copilot, and flight engineer. All flight controls and indicators, as well as their operation during normal and emergency ground and flight procedures, are specified.

Determination of 2F69D functional systems required to support training program goals was based on a comparison of NAVRES stated requirements with the systems, controls, and indicators shown by NATOPS to be involved.

During the process of identifying pilot and flight engineer OFT requirements, consideration was given to the possible existence and adequacy of alternate "hands-on" training capabilities or options so that requirements/capabilities were not specified where existing capabilities were adequate.

Conclusions about the extent of refurbishment are the province of the NAVTRAEQUIPCEN, NAVAIRSYSCOM, and CNAVRES and will involve cost factors associated with refurbishment and cost comparisons with alternative systems.

SECTION II

RESASWTAC TRAINING PROGRAM

MISSION

The RESASWTAC mission is to provide ASW training to all VP, VS, and HS reserve air activities. Specialized P-3 A/B training is provided to USNR, USN, and foreign flight crews and maintenance personnel. In addition to the basic mission, RESASWTAC provides celestial navigation training for all navigators, oceanography and basic ASW for all ASW activities, and communication operator training for VR squadrons.

TRAINEES

A typical training load during a 1-year period is listed below:

- ACDUTRA involving 255 pilots and 170 flight engineers who will report to NAS Willow Grove 1 week each year
- Transition training for 48 non-P-3 pilots
- Weekend pilot and flight engineer proficiency training involving 864[1] pilots and flight engineers
- Instructor-Under-Training (IUT) involving 50 pilots
- Squadron Augment Unit (SAU) training involving 91 pilots
- Advanced second mechanic training involving 32 flight engineers

[1] Because of the distance of some NAVRES squadrons from RESASWTAC, all pilots will not have access to the OFT.

- Second mechanic initial training involving 32 flight engineers
- Systems review training involving 24 flight engineers
- NATOPS checks involving 75 pilots and 30 flight engineers
- Transition training involving 28 former P-3C pilots.

PLANNED UTILIZATION OF 2F69D OFT

The present RESFORON flight hour allowance is 120/pilot/year. The minimum number of flight hours, as established by CNO, is 100/pilot/year.

Though OPNAVINST 3710.7J states that up to 50 percent of required annual flying time can be performed in a 2F69D type device, pilot flight currency requirements specify that 45 hours of flying time each 6 months, or 90 hours each year, must be performed in the aircraft. Thus, it would be possible for a NAVRES pilot to substitute up to 30 hours of his annually funded 120 hours of flying time in an approved OFT such as the 2F69D. RESASWTAC intends to take advantage of simulator substitution and conduct 60 to 65 percent of the NATOPS check and the entire instrument check in the OFT. OFT use in lieu of the aircraft will provide for a more beneficial use of funded aircraft flying hours (such as additional full crew operational/training missions).

In addition to training conducted by RESASWTAC, the RESFORONs also have requirements for training in the OFT. The Patrol Squadron/ Unit Training Manual (CNAVRESINST 3500.2A) specifies the following OFT use in P-3 A/B pilot and instructor pilot qualification:

- Phase III initial qualification for third pilot requires satisfactory completion of OFT periods 1 - 4 (see appendix A)
- Phase III initial qualification syllabus for patrol plane commander requires that OFT training session 5 be used as the basis for Personnel Qualification Standards (PQS) criteria and qualification (see appendix B for OFT 5 tasks)
- Instructor pilot (IP) qualification requires IUT OFT 1 (see appendix C).

Flight engineer OFT use is not specified in the instruction.

Planned annual OFT utilization hours are listed in table 1 along with user pipeline count and training period data. The data show that NAVRES plans heavy utilization of an OFT in support of their training program and aircrew evaluation requirements.

TABLE 1. PLANNED ANNUAL OFT UTILIZATION

Category of Use	User Count	OFT Periods/ Period Length	Hours of Utilization
ACDUTRA	255 P 170 FE	2/4 Hrs*	1,133
Non-P-3 Trans.	48 P	8/4 Hrs	768
Weekend Training	864 P/FE	4/4 Hrs*,**	768
IUT	50 P	2-3/4 Hrs***	500
SAU	91 P	2/4 Hrs	364
Adv. 2nd Mechanic	32 FE	2/4 Hrs	256
Init. 2nd Mechanic	32 FE	2/4 Hrs	256
System Review	24 FE	2/4 Hrs	192
NATOPS Checks	75 P 30 FE	1/1.5 Hrs***	158
P-3C to P-3 A/B	28 P	2/4 Hrs	112
Instr. Checks	50 P	1/1.5 Hrs***	120
		Total Hours of Utilization	4,627

* A maximum of 28 weekends will be available for this t aining.
** Not all pilots will receive their OFT training at RESASWTAC.
***Pilot checks and instructor training will apply to one pilot per OFT period.

SECTION III

FUNCTIONAL SIMULATION REQUIREMENTS

SIMULATION REQUIREMENTS FOR PILOT, COPILOT, AND FLIGHT ENGINEER

Functional simulation requirements of the 2F69D and alternative devices are directly tied to training tasks required to train the various categories of users shown in table 1. The OFT training tasks involved are contained in the present Patrol Squadron/Unit OFT syllabus for the plane commander and third pilot (see appendices A, B, and C). The syllabus for third pilot OFT sessions 1 through 4 is organized on a "phase-of-flight" basis; i.e., each session begins with the before-start checklist and progresses through taxi-takeoff-climb-cruise-descent-landing and secure checklist. During each phase of flight, normal and emergency procedures are covered. OFT 5, pertaining to command pilot training, is concerned primarily with malfunctions.

All tasks trained in the OFT are covered in NATOPS which specifies the normal and emergency procedures for operating all systems, controls, and indicators involved in each task. Therefore, it is possible to refer to NATOPS to identify the aircraft system controls and indicators necessary to train each task. The OFT functional simulation required to adequately train the tasks will be those identified during this process.

Training tasks and the references which identify the equipment involved for the pilot, copilot, and flight engineer are shown in table 2. Associated NATOPS (NAVAIR 01-75 PAA-1) or other checklist references are included to provide engineering personnel

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS

TRAINING TASKS (NORMAL PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
Auxiliary Power Unit Procedures Inspection		Items 23 & 24	
- Turnaround interior checks	Sec 3-2 & 3-3		
. APU or external power preoperational check			
. Flight station check			
- APU ground operation			
- Starting the APU			
- Stopping the APU			
Preflight Inspection	Sec 3-3		
- Auto feather checks			
- Auto feather system			Card 11
- Prop unfeather system			
- Engine fire warning test			
Automatic Pilot and MM-4 Flag/Source Ground Check	Sec 3-4 & 3-5		
Before Starting Engines	Sec 3-5		
Starting Engines	Sec 3-5		
- Normal start (electrical system, including control panel, must operate)	Sec 3-6		
- Oil cooler flap switches and control panel must also operate			
- Control of bleed air manifold pressure gauge is required			
- Stagnated and stalled start	Sec 3-8		
- Hot start	Sec 3-8		

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (NORMAL PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
After Start (Item 4, MAD and Doppler power not required)	Sec 3-8		
Engine Ground Operation	Sec 3-8		
Aircraft Lights Operation (only dummy switches needed)	Sec 3-8		
Operational Checks	Sec 3-10		
- Fuel governor, pitch lock and reverse horsepower check (Systems must be operable)	Sec 3-10		
- Engine anti-ice check	Sec 3-11		
- Wing de-ice system check	Sec 3-11		
Takeoff (Item 1 condition V-set and item 17 harness-set not required)	Sec 3-12		
Takeoff Procedures	Sec 3-12		
- Normal takeoff	Sec 3-12		
- After takeoff climb	Sec 3-14		
Climb (Gauges, switches must be operable; dummy swithces for lights)	Sec 3-14		
In-flight NTS Check (NTS must operate)	Sec 3-15		
- Cruise (Autopilot must be operable; Radar altimeter not required)	Sec 3-15		
- Engaging automatic pilot in flight (Radar altimeter not required)	Sec 3-16		

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (NORMAL PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
Two- and Three-Engine Loiter Procedures	Sec 3-17		
- Two- and three-engine loiter shutdown procedure	Sec 3-18		
Crossfeed Procedure	Sec 3-18		
Engine Restart During Flight (Restart)	Sec 3-18		
Descent Procedures	Sec 3-20		
Landing Procedures	Sec 3-20		
- Approach (Item 2 set condition V not required)	Sec 3-20		
- Landing	Sec 3-22		
Wave-off	Sec 3-25		
After Landing (Items 3 IFF-set not required)	Sec 3-25		
Securing the Aircraft	Sec 3-25		
Windmill Start Procedures	Sec 3-33		
Instrument Approaches	Require: (1) GCA and one other landing and (TACAN, VOR, or ILS without glideslope) (2) Pilot and copilot speaker must be operative (3) UHF radio communication		
TRAINING TASKS (EMERGENCY PROCEDURES)			
General Emergency Procedures	Sec 5-1		
- APU fire	Sec 5-1		
- Fuselage fire or electrical fire of unknown origin	Sec 5-2		

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (EMERGENCY PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
Ground Emergencies	Sec 5-28		
- Engine fire on the ground	Sec 5-28		
Takeoff Emergencies	Sec 5-29		
- Engine failures	Sec 5-29		
. During takeoff	Sec 5-29		
. Prior to refusal speed	Sec 5-29		
. After reaching refusal speed	Sec 5-29		
Propeller Malfunctions	Sec 5-31		
- Propeller malfunctions below refusal speed (Must have corresponding control "feel")*	Sec 5-31		
- Propeller malfunction above refusal speed (Must have corresponding control "feel")*	Sec 5-31		
In-flight Emergencies	Sec 5-33		
- Automatic pilot disconnect	Sec 5-33		
- Electrical system failures	Sec 5-33		
. Generator failure	Sec 5-33		
. Operation with one AC generator (Load monitoring of circuit is required)	Sec 5-33		
. Use of APU in flight	Sec 5-34		
. APU in-flight start procedures	Sec 5-34		
. APU in-flight with altitude automatic load monitoring	Sec 5-34		

* Requires instructor/subject matter expert evaluation/validation.

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (EMERGENCY PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
. Generator reset procedures	Sec 5-35		
.. Overvoltage reset	Sec 5-35		
.. Undervoltage reset	Sec 5-35		
- Engine failure (Item a, extreme or abnormal engine vibration, not required)	Sec 5-36		
. No. 1 and No. 2 engines inoperative	Sec 5-36		
. No. 2 and No. 3 engines inoperative	Sec 5-36A		
. No. 3 and No. 4 engines inoperative	Sec 5-36A		
. No. 1 and No. 4 engines inoperative	Sec 5-36A		
. No. 1 and No. 3 engines inoperative	Sec 5-36A		
. No. 2 and No. 4 engines inoperative	Sec 5-37		
. Decoupling (Good fidelity required)	Sec 5-37		
. Temperature datum system malfunction	Sec 5-38		
- Engine shutdown procedure	Sec 5-38		
- Flight control system malfunctions	Sec 5-38		
. Shifting to boost-off in flight	Sec 5-38		
. Turning boosters on or off in flight	Sec 5-39		

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (EMERGENCY PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
- Fuel system failure	Sec 5-39		
. Fuel quantity indicating system failure	Sec 5-39		
. Fuel boost pump failure	Sec 5-39		
.. Fuel boost pump failure in climb	Sec 5-40		
. Transfer pump failure, tank 5	Sec 5-40		
- Oil system failure (engine)	Sec 5-41		
. Magnetic chip detector indication	Sec 5-41		
. EDC failure	Sec 5-41		
- Propeller malfunctions	Sec 5-41		
. Operation without RPM indication	Sec 5-41		
.. Propeller pump warning lights	Sec 5-41		
. RPM fluctuation in flight	Sec 5-42		
. Propeller offspeed in flight	Sec 5-42		
. Operation with pitch-locked propeller (Good fidelity required)	Sec 5-42		
. Propeller fails-to-feather-completely	Sec 5-43		
- Propeller malfunction during landing	Sec 5-43		
- Loss of all airspeed indication	Sec 5-44		

TABLE 2. EQUIPMENT REFERENCES FOR TRAINING TASKS (continued)

TRAINING TASKS (EMERGENCY PROCEDURES)	REFERENCES		
	NATOPS 01-75 PAA-1	NAVAIR 01-75PAC-6-1	MRC
- Hydraulic power system failure	Sec 5-47		
. Failure of No. 1 & No. 2 hydraulic systems	Sec 5-47		
Landing Gear System Emergencies	Sec 5-47		
- Unsafe landing gear indication	Sec 5-47		
- Unlocked gear indication landing	Sec 5-48		

with more comprehensive and detailed data, should they be needed.[2]

INSTRUCTOR STATION REQUIREMENTS

Instructor station requirements are shown separately from the pilot, copilot, and flight engineer station requirements.

RESASWTAC school personnel request that the forward or rear instructor station have control over the following variables:

- Emergency conditions as specified in NATOPS section 5-1, 2
- NAVAID control capabilities specific to VOR, TACAN, ILS (no glideslope) and GCA (including controller simulation capability)
- UHF radio (ICS and transmit monitoring and communication).

Instructor control of the following annunciator panel lights and corresponding system functions is required:

- No. 1, 2, 3, or 4 primary fuel pump lights during start
- No 1, 2, 3, and 4 auto feather lights
- No. 1, 2, 3, or 4 engine starter control valve open lights
- No. 1, 2, 3, or 4 prop feather button lights
- Fan out light
- EDC temperature high light
- Refr. overheat light
- Left and right wing hot lights
- No. 1, 2, 3, and 4 engine bleed air valve lights

[2] A copy of all references annotated to show required and non-required OFT equipment has been forwarded with this report to appropriate NAVTRAEQUIPCEN project and engineering personnel.

- Left and right fuselage bleed air shutoff valve lights
- Leading edge hot light
- EMP de-ice light
- No. 1, 2, 3, and 4 engine anti-ice advisory light
- Windshield heat cycling lights
- Left and right heater out pitot heater light
- No. 1, 2, 3, or 4 feather valve and NTS lights
- Doors light
- Armed light
- No. 1, 2, 3, and 4 filter light
- No. 1, 2, 3, and 4 pressure low light
- No. 1, 2, 3, and 4 tank shutoff valve advisory lights
- No. 1, 2, 3, and 4 X feed valve advisory lights
- Cross ship X feed valve advisory light
- Tank boost pump low pressure advisory light
- Transfer pumps pressure low advisory light
- Generator mechanical failure lights
- Chips lights
- Oil hot lights
- Oil pressure lights
- Prop pump No. 1 and 2 lights
- Beta lights
- Fuselage duct hot lights
- Cabin pressure lights
- Master de-icing light
- Master electrical power light
- Master pressure system light

- Start valve light
- Autopilot/RAWS warning light
- Flap asymmetry light
- Door open light
- Rudder power light
- No. 1, 1A, and 2 hydraulic pressure lights
- No. 1, 1A, and 2 hydraulic oil hot lights
- NTS inoperative light
- Generator off light
- APU generator off light
- Transformer-rectifier overheat light
- Propeller overspeed light
- Propeller decoupling light
- Engine fire light
- Engine paralleling

The main control panel must have the following instructor-controlled capabilities:

- Hydraulic quantity reservice
- Fuel/refuel
- HRD system reservice
- Engine oil reservice
- Engine instrument gauge adjustment (ability to change readings)
- T.I.T. gauge (control of engine temperature)
- Start button (premature pop)

The functional simulation required to support the training of tasks listed in table 2 comprises all but two of the major systems and capabilities of a modern operational flight trainer. The two exceptions are the visual and motion systems. A detailed engineering evaluation should be conducted to validate this observation.

SECTION IV

REFURBISHMENT PRIORITIES AND SUPPORT PERSONNEL

REFURBISHMENT PRIORITIES

The high degree of 2F69D OFT system component interrelationships did not make it feasible to assign priorities to specific systems or subsystems on a basis of user training requirements. Most normal and emergency procedures involve numerous subsystems, each of which is critical to required and frequently-performed aircrew tasks.

"Priority" information was obtained for NAVAIDS and the motion system. NAVAIDS priorities are as follows:

FIRST - A usable GCA capability and one other landing aid (TACAN, VOR, or ILS without glidescope).

SECOND - Complete refurbishment of the present NAVAID package.

THIRD - An updated digital NAVAID package similar to that included on more modern OFTs; e.g., Device 2F87F.

Obviously, if dollar cost and implementation delays were not involved, the priorities above would be reversed.

Trainer motion was not considered to be a high priority requirement. Instructors placed motion in a "nice-to-have" versus a "required" category. This instructor attitude is supported by

other studies[3,4] which report that use of motion increases pilot acceptance of operational flight trainers. The TAEG study also reports no major effect in simulator or aircraft performance as a function of motion in the simulator.

RESASWTAC 2F69D SUPPORT PERSONNEL

The RESASWTAC school, after analyzing overall 2F69D WST support requirements, has requested the following billets:

- 29 TDs (22 requested and 7 existing)
- 13 civilian technicians (existing)
- 1 GS-11 FER (billet requested).

School personnel state that they do not anticipate problems in filling their new billets or in training new personnel. Some newly assigned TDs are already attending training courses.

Implementation of the 2F69D into the training program is very likely to be a difficult and demanding effort, especially if performed by a staff composed of TDs and technicians with limited analog and 2F69D experience. For this reason, and to prevent resulting long delays in making the device ready for training, it is recommended that NAVRES consider obtaining augmented support

[3] Ryan, L. E., Scott, P. G., and Browning, R. F. The Effects of Simulator Landing Practice and the Contribution of Motion Simulation to P-3 Pilot Training. TAEG Report No. 63. 1978. Training Analysis and Evaluation Group, Orlando, FL.

[4] Martin, E. L. and Waag, W. L. Contributions of Platform Motion to Simulator Training Effectiveness: Study 1 - Basic Contact. AFHRL-TR-78-15. 1978. Air Force Human Resources Laboratory, Flying Training Division, Williams Air Force Base, Arizona.

from other agencies to assist in device implementation and check-out, and to provide necessary technician training. NAVEDTRASUPP-CENLANT and FASOTRAGRULANT commands should be consulted for additional support.

Arrangements are underway to have newly assigned RESASWTAC School TDs attend a 2-week course on the 2F69D at NAS Brunswick. The course, though undoubtedly beneficial, will fall far short of providing job readiness and the provision of additional training should be strongly considered. The need for more adequate training is indicated because experienced 2F69D technicians report that existing maintenance publications do not support, or cannot be readily used by, inexperienced personnel.

SECTION V

TRAINING DEVICE ALTERNATIVES AND RECOMMENDATION

TRAINING DEVICE ALTERNATIVES

Five options or alternatives are considered relative to NAVRES training requirements at NAS Willow Grove, Pennsylvania. Each alternative has advantages and disadvantages in terms of user training requirements, usability, supportability, and cost. Alternatives listed in order of increasing estimated dollar cost, with associated major considerations, are discussed below. A matrix facilitating a comparison of alternatives is shown in table 3.

1. Convert 2F69D to a CPT-level device. A CPT, though cheaper to maintain and use than an OFT, would fail to meet many user NATOPS check, instrument check, and instructor and transition training requirements. A CPT would support training for a significant number of emergency procedures but would be very limited and less capable for a substantial portion of realistic normal procedure training. Restricted capability would undoubtedly cause limited acceptance and training use.

2. Transfer the 2F69D "as is" and attempt improved maintenance/logistics support. This option would leave most existing major logistics problems untreated. The parts supply problem, which is a major cause of the existing unacceptable 2F69D maintenance and reliability status,

TABLE 3. ALTERNATIVE MEDIA CAPABILITY AND COST FACTORS

ALTERNATIVES	NATOPS CHECKS	INSTRU-MENT CHECKS	INSTRUC-TOR TRNG	ONGOING PILOT & FLT ENGR TRAINING	TRAINING IMPLEMEN-TATION DELAY	ESTIMATED INITIAL COST	ANTICIPATED RELIABILITY
CPT level conversion	F	F	F	P-	Moderate	Low	Normal
Transfer device "as is"	P-	P	P	P-	Very little	Low	Poor
Refurbish required existing components	P	P	P	P	Moderate	Moderate	Fair to normal
Refurbish required existing components and upgrade NAVAIDS and control loading capabilities	P+	C	P+	P	Moderate	Moderate to high	Normal
Procure a 2F87F OFT	C-	C	C	C	Excessive	Very high	Normal

Legend: F indicates a failure to meet training requirements.
P indicates a partial training capability.
C indicates a complete or nearly complete training capability.

NOTE: Specific initial cost and training implementation delay data will require further analysis by the NAVTRAEQUIPCEN engineering staff.

would continue. It is very doubtful that the Naval Reserves would accept this option unless future funding for a 2F87F could be promised within the next 2 or 3 years. The option would, however, provide the quickest training capability to the user, a very important factor due to existing NAVRES training requirements.

3. Overhaul/refurbish required existing components (without digital upgrade). This option, if performed in a way that would minimize existing reliability problems and restore device design capabilities, would meet most user training requirements. Unless many key components and spares were produced and made available within the supply system, the device would still be marginally reliable and would not, over an extended time period, be fully usable. The radio navigational aids capability would still be difficult to use, marginally accurate, and costly to maintain. Instrument training would undoubtedly be impaired by system availability and reliability.

4. Overhaul/refurbish required existing components and digitally upgrade the NAVAIDS capability. This option would have the same features as alternative No. 3 above but would provide for a more accurate and usable navigation capability. Reliability and maintainability of the NAVAIDS package would significantly be improved. This option would, however, be significantly more costly and may cause a longer delay than alternatives 2 or 3 in device training implementation.

5. Procure a new digital 2F87F. This option, if selected alone, though fully meeting training requirements, could cause a 2 to 5-year delay in device training implementation. Initial cost factors, however, would be relatively high in comparison to the other options. Among the advantages of a 2F87F is that the device would meet NAVRES training requirements when the RESFORONs convert from the P-3 A/B to the P-3C aircraft (which they eventually will do). During the interim, the device would be much more reliable than the 2F69D and is capable of providing training for P-3 A/B pilots. The cost effectiveness of training using the 2F87F is well documented.[5,6,7]

RECOMMENDATION BASED ON TRAINING CONSIDERATIONS

Existing and planned NAVRES OFT training requirements, exclusive of unknown budget constraints, appear to justify combining the alternatives of transferring the Brunswick 2F69D to Willow Grove and initiating plans to procure a follow-on 2F87f. The 2F87F alternative alone, though meeting training capability

[5] Browning, R. F., Ryan, L. E., Scott, P. G., and Smode, A. F. Training Effectiveness Evaluation of Device 2F87F, P-3C Operational Flight Trainer. TAEG Report No. 42. 1977. Training Analysis and Evaluation Group, Orlando, FL.

[6] Browning, R. F., Ryan, L. E., and Scott, P. G. Utilization of Device 2F87F OFT to Achieve Flight Hour Reductions in P-3 Fleet Replacement Pilot Training, TAEG Report No. 54. 1978. Training Analysis and Evaluation Group, Orlando, FL.

[7] Op. cit. TAEG Report No. 63.

and availability requirements, would require the user to be deprived of an OFT device for several more years. Planned training utilization previously shown in table 1 presents a sound argument for providing an OFT capability at the earliest feasible date. The existing 2F69D at NAS Brunswick, though impaired by serious maintenance and logistics problems, could contribute significantly to the NAVRES program at NAS Willow Grove until a 2F87F could be procured and implemented. RESASWTAC training personnel recently "flew" the 2F69D at NAS Brunswick and reported that in its present condition the device would be exceptionally valuable to their training program.

The 2F69D at NAS Brunswick has been used heavily without major refurbishment for a period of 13 years. With well managed maintenance and logistics support, the device should be usable for several more years, but it is very doubtful that it can be feasibly maintained over the extended service life of the P-3. For this reason, it is recommended that an early effort be initiated to procure a reliable device, such as the 2F87F for follow-on training.

Selecting the option of combining both alternatives would initially impose a high maintenance burden on support personnel because the knowledge and skill level required to maintain the 2F69D in an "as is" condition would be relatively high. The alternative of transferring the Brunswick 2F69D to Willow Grove keeps the door open for other alternatives such as updating the NAVAID package and/or the control loading system. Decisions to implement these alternatives would be dependent upon the 2F87F procurement outcome and, if procured, the associated RFT date.

SECTION VI

AN IMPORTANT COST FACTOR

Decisions related to refurbishment will be based on training requirements, cost, scheduling, availability of parts and technical capabilities, and alternative solutions; i.e., other media or training methods. There is little doubt that cost will be a principal consideration. This section of the report will address one cost factor that should be considered in addition to those costs associated with procuring, modifying, or refurbishing the 2F69D or other devices.

With the effective use of an OFT, the cost[8] savings from flight hour reductions could be sufficient to justify any training solution considered in this report. However, the achievement of a savings in flight hours is dependent upon RESASWTAC and the Reserve Squadrons setting flight hour savings as a goal. This is not likely to occur. Although the Chief of Naval Operations (CNO) authorized flight hour minimum is 100 hours/pilot/year, the Reserve feels strongly that their present flight time allowance of 120 hours/pilot/year is insufficient.

It is not the purpose or intent of this report to dispute flight hour requirements of the Naval Reserve; however, the opportunity for flight hour reductions should be addressed. Resultant savings would offer the Reserve a powerful argument in their attempt to obtain a flight simulator.

[8] The cost data shown in this section are not precise and should not be used for budget purposes. The data are close estimates of actual simulator and aircraft costs and are adequate for planning purposes.

Without benefit of their own flight simulator (they have limited access to others), the Naval Reserve administers an air program involving over 35,000 flight hours each year in the P-3 A/B aircraft. Since each flight hour counts as two pilot hours, 35,000 flight hours represent 70,000 pilot hours. There is no question that an OFT could contribute significantly to the Reserve program. The data shown in table 4 attest to the possible savings.

The data are based on RESASWTAC intentions to give 60 to 65 percent of the NATOPS check and the entire instrument check in Device 2F69D. RESASWTAC estimates they will provide NATOPS checks to 75 pilots/year and instrument checks to 80 pilots/year. The possible flight hour and cost savings are shown.

The data in table 4 only reflect flight hour reductions and cost savings when using the 2F69D for NATOPS and instrument checks. There is ample evidence that flight hours in other areas of the RESFORON curriculum could be reduced through use of the 2F69D. For example, one study[9] by TAEG has shown that effective use of the 2F69D can significantly reduce the flight hours in the FRS squadrons. In that study, flight hours were reduced from 19.25 to 11.75, a 42 percent reduction. This does not suggest a reduction of that magnitude is possible, or even desired, for the Reserve program. It does show the effectiveness of training

[9] Browning, R. F., Ryan, L. E., and Scott, P. G. Training Analysis of P-3 Replacement Pilot and Flight Engineer Training. TAEG Report No. 10. 1973. Training Analysis and Evaluation Group, Orlando, FL. AD 773745

TABLE 4. COST SAVINGS THROUGH USE OF DEVICE 2F69D FOR NATOPS AND INSTRUMENT CHECKS

Column	(1)	(2)	(3)	(4)	(5)	(6)
	Flight Hrs Saved	Squadron Pilots	Total Hrs Saved/Yr Cols (1x2)	Total Operating Cost/Hr* P-3	Total Operating Cost/Hr** 2F69D	Cost Savings/Year Cols (3x4)-(3x5)
Trainer NATOPS Check	2.0	75	150	1,412	100	196,800
Trainer Instrument Check	2.0	80	160	1,412	100	209,920
					TOTAL	$406,720

* From Navy Program Factors Manual OPNAV 90P-02B, revised 31 Aug 1978. Total operating costs include petroleum, oil, lube, maintenance, replenishment spares, aircraft reworks O&M, aircraft OPS O&M, and SDLM O&M. Military salaries have been excluded from these cost estimates.

P-3A total operating cost $1,412/flt hr.
P-3B total operating cost $1,413/flt hr.
Average cost $1,412/flt hr (rounded to nearest dollar)

** From POM 79, U.S. Navy, U.S. Naval Reserve, U.S. Marine Corps OSD/OMB budget for simulator and training device programs. The POM shows the hourly operating cost for the 2F87 WST and the 2F69D WST to be $313.20. The 2F87F OFT is shown to be $115.43; no cost is shown for the 2F69D OFT. The operating cost of the 2F69D OFT is assumed to be slightly less than that of the 2F87F OFT since the 2F69D has no visual system. In this report the operating cost of the 2F69D OFT is estimated to be $100/hr. The operating costs include costs such as spares, electricity, heat, water, and maintenance. Field engineer salaries are also included. Military personnel salaries and MILCON are not included.

using the device. Although the mission and training goals of the Reserve and FRS are different, in many respects the curricula are identical.

Figure 1 shows cost savings possible through a reduction in RESFORON flight hours. The total cost for operating the 2F69D OFT 4,627[10] hours annually is also shown. Cost savings associated with flight hour reductions are calculated as follows:

Pilots in RESFORON X flight hour reductions X P-3 A/B operating cost/hour = annual cost savings.

585 X 1 X 1,412 = $826,020

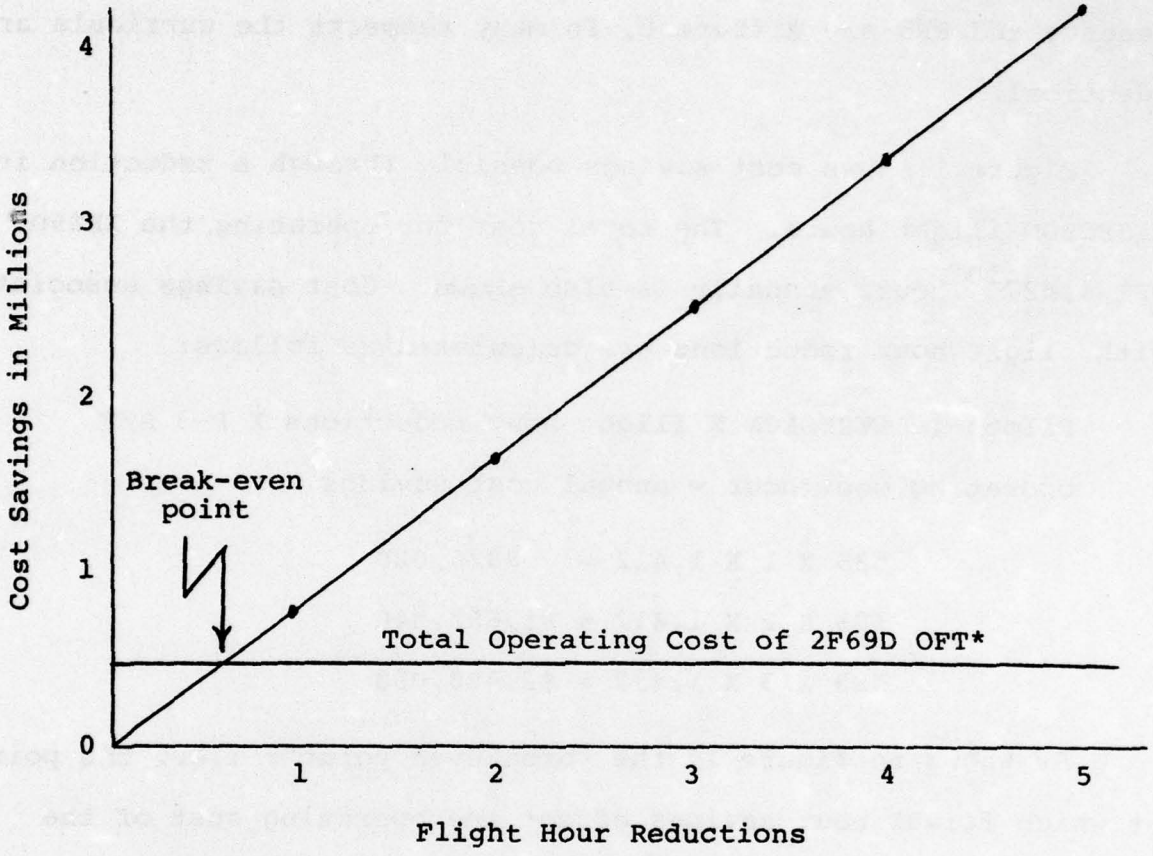
585 X 2 X 1,412 = $1,652,040

585 X 3 X 1,412 = $2,478,060

As shown in figure 1, the "breakeven point"; i.e., the point at which flight hour savings offset the operating cost of the simulator, occurs at less than 1 hour/pilot/year. The exact number is .56 flight hours reduction/pilot/year required for the Reserve to offset the total cost of operating Device 2F69D OFT. This small reduction in flight hours could be accomplished with either Device 2F69D or Device 2F87F.

A reduction of .56 flight hours would not violate CNO regulations and would be in line with DOD "policy" to reduce flight hours. At this time, regulations authorize the substitution of 50 hours in the OFT for 50 hours in the P-3 A/B in meeting the CNO minimum requirements of 100 hours/pilot/year.

[10] RESASWTAC estimate.



*Based on RESASWTAC estimate (4,267 hrs x $100/hr).

Figure 1. Cost Savings vs. Flight Hour Reduction

However, for annual qualification purposes, pilots need 45 hours in the aircraft every 6 months (90 hours/year). Thus, the Reserve could choose to reduce flight hours from 120 to 90/pilot/year.

The authors of this report do not make any recommendations relative to flight hour reduction. The above data are presented to support the justification of an OFT for the Naval Reserve air program on the basis of cost savings through minimal flight hour reductions, should such a consideration be required.

APPENDIX A

PATROL SQUADRON/UNIT SYLLABUS FOR OFT 1, 2, 3, AND 4

This appendix is a copy of the OFT syllabus from the Patrol Squadron/Unit Training Manual (CNAVRESINST 3500.2A).

PILOT P3 A/B OFT 1

PQS REF	TASK	COMP
401.19	BEFORE START CHECKLIST (DUAL RESPONSE)	
NA	START BRIEF	
NA	BATTERY START	
NA	USE OF GROUND AIR AND GROUND POWER FOR START	
401.28	ENGINE START (NORMAL)	
401.120	AFTER START CHECKLIST	
401.121	TAXI (DISCUSS PROCEDURES, BRAKE FEEL AND USE, POWER LEVEL USE, RPM SHIFT)	
NA	ANTI-ICE/DE-ICE SYSTEMS CHECKS AND MALFUNCTIONS	
401.122	TAKE-OFF CHECKLIST	
NA	RADIO SET-UPS	
NA	TAKE-OFF BRIEF	
401.21	TAKE-OFF	
401.124	CLIMB CHECKLIST	
401.222	NTS CHECK	
NA	GOVERNOR INDEXING	
401.123c	NORMAL CLIMB	
401.123d	TRANSITION TO CRUISE	
NA	AIR CONDITIONING AND PRESSURIZATION SYSTEM USE	
401.127	DESCENT CHECKLIST	
401.123h	NORMAL DESCENT	
401.128	LANDING CHECKLIST	
401.26	NORMAL LANDING	
401.27	WAVE-OFF	
401.320	NO BETA LIGHT ON LANDING	
NA	FLIGHT IDLE STOP OVERRIDE	
401.129	AFTER LANDING CHECKLIST	
401.52	FUEL GOVERNOR/PITCHLOCK/REVERSE HORSEPOWER CHECK	
401.130	SECURE CHECKLIST	

COMMENTS: _____

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☐ COMPLETE ☐ INCOMPLETE

PILOT NAME: _____ INSTRUCTOR SIGNATURE _____

DATE: _____ OFT HOURS _____

PILOT P3 A/B OFT 2

PQS REF	TASK	COMP
401.19	BEFORE START CHECKLIST	
NA	START BRIEF	
NA	STAGNATED START	
NA	STALLED START	
401.42	ENGINE FIRE ON GROUND	
401.120	AFTER START CHECKLIST	
401.122	TAKE-OFF CHECKLIST	
NA	USE OF AUTO FEATHER	
401.123a	NORMAL TAKE-OFF PROCEDURES	
401.124	CLIMB CHECKLIST AND PROCEDURES	
401.22	NTS CHECK	
NA	FUEL MANAGEMENT/TRANSFER/CROSSFEED	
401.35	FUEL BOOST PUMP FAILURE	
401.316	TRANSFER PUMP FAILURE	
401.51	FUEL DUMP	
NA	ENG DRIVEN CENTRIFUGAL BOOST PUMP FAILURE	
401.38	LOW HYDRAULIC FLUID QUANTITY	
401.318	HYDRAULIC SYSTEM FAILURE (DISCUSS LANDING W/O #1 SYS)	
401.319	UNSAFE GEAR INDICATIONS	
401.418	LANDING GEAR EMERGENCIES	
401.410	BOOST PACKAGE MALFUNCTIONS	
401.33	HIGH ENGINE OIL TEMP	
401.34	LOW ENGINE OIL PRESSURE	
401.39	LOW ENGINE OIL QUANTITY	
401.412	MAGNET IC CHIP DETECTOR INDICATION	
401.37	"E" HANDLE VIBRATION	
401.32	FLUX SHP, TIT, F/F	
401.47	ENGINE FAILURE IN FLIGHT (DEMO SHUTDOWN, DISCUSS "E" HANDLE)	
401.24	ENGINE RESTART DURING FLIGHT (NORMAL)	
401.127	DESCENT CHECKLIST	
401.128	LANDING CHECKLIST	
401.41	BRAKE FIRE/HOT BRAKE	
401.130	SECURE CHECKLIST	

COMMENTS: _____

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☐ COMPLETE ☐ INCOMPLETE

PILOT NAME: _____ INSTRUCTOR SIGNATURE _____

DATE: _____ OFT HOURS _____

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PILOT P3 A/B OFT 3

PQS REF	TASK	COMP
401.19	BEFORE START CHECKLIST	
NA	START BRIEF	
NA	START MALFUNCTION (OVERTEMP T/D PROTECTION)	
401.120	AFTER START CHECKLIST	
401.122	TAKE-OFF CHECKLIST	
401.43	MALFUNCTION PRIOR TO VR (4 ENG ABORT)	
NA	TAKE-OFF PROCEDURES	
401.124	CLIMB CHECKLIST AND PROCEDURES	
401.22	NTS CHECK	
401.314	TEMP DATUM SYSTEM CHECK AND MALFUNCTION	
401.35	TIT OVERTEMP	
401.59	DITCHING DRILL PROCEDURES	
401.31	RPM FLUX	
401.311	PROP OFFSPEED IN-FLIGHT	
401.317	TACH GEN FAILURE	
401.413	PROP OVERSPEED IN-FLIGHT WITH AND W/O PROP PUMP LIGHTS	
401.414	PROP FAILS TO FEATHER	
401.415	PROP PUMP WARNING LIGHTS	
401.416	PITCHLOCK PROP	
401.48	DECOUPLE	
401.24	ENGINE RESTART IN-FLIGHT (NORMAL, BLADE ANGLE NO ROTATION, NO OIL PRESSURE	
401.419	FUSELAGE/ELECTRICAL FIRE OF UNKNOWN ORIGIN	
401.420	SMOKE AND FUME ELIMINATION	
401.57	EMERGENCY DESCENT PROCEDURES	
401.58	EMERGENCY DEPRESSURIZATION	
NA	AIR CONDITIONING AND PRESSURIZATION SYSTEM	
401.127	DESCENT CHECKLIST	
401.128	LANDING CHECKLIST	
401.129	AFTER LANDING CHECKLIST	
401.52	FUEL GOVERNOR PITCHLOCK/REV HP CHECK	
401.130	SECURE CHECKLIST	

COMMENTS: _____

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☐ COMPLETE ☐ INCOMPLETE

PILOT NAME: _____ INSTRUCTOR SIGNATURE: _____

DATE: _____ OFT HOURS: _____

PILOT P3 A/B OFT 4

PQS REF	TASK	COMP
401.19	BEFORE START CHECKLIST	
NA	START BRIEF	
NA	START MALFUNCTION (START VALVE)	
401.42	ENGINE FIRE ON THE GROUND	
401.120	AFTER START CHECKLIST	
NA	RUNAROUND RELAY CHECK MALFUNCTION	
401.122	TAKE-OFF CHECKLIST	
401.43	MALFUNCTION PRIOR TO VR	
401.44	MALFUNCTION AFTER VR (OVERSPEED)	
401.22	NTS CHECK	
NA	MALFUNCTION DURING NTS CHECK	
401.311	PROP OFFSPEED IN-FLIGHT	
401.31	FLUX RPM	
401.414	FAILURE OF PROP TO FEATHER	
401.14d	ENGINE RESTART INFLIGHT (NO LITE-OFF, OVERSPEED)	
401.123e	THREE ENGINE LOITER	
401.14d	ENGINE RESTART INFLIGHT (NTS-INOP)	
402.48	ELECTRICAL BUS FAILURES (ALL BUSES, INDICATIONS, PRIORITY, RUNAROUND RELAYS, TRANSFER RELAYS, SIGNIFICANT EQUIPMENT POWERED BY EACH BUS)	
402.48	TRANSFORMER RECTIFIER FAILURES	
401.312	GENERATOR FAILURE	
401.46	MULTIPLE GENERATOR FAILURE	
NA	APU INFLIGHT OPERATION/LOAD MONITORING/SINGLE GENERATOR OPERATION	
NA	RESTORING ELECTRICAL POWER	
401.31	CRACKED WINDSHIELD	
401.59	DITCH DRILL	
401.127	DESCENT CHECKLIST	
401.128	LANDING CHECKLIST	
401.310	EMERGENCY BRAKE OPERATION	
401.129	AFTER LANDING CHECKLIST	
401.130	SECURE CHECKLIST	

COMMENTS: _____

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☐ COMPLETE ☐ INCOMPLETE

PILOT NAME: _____ INSTRUCTOR SIGNATURE _____

DATE: _____ OFT HOURS _____

APPENDIX B

PATROL SQUADRON/UNIT SYLLABUS FOR OFT 5

This appendix is a copy of the OFT syllabus from the Patrol Squadron/Unit Training Manual (CNAVRESINST 3500.2A).

PILOT P3 A/B PPC OFT 5

PQS REF	TASK	COMP
NA	COCKPIT PREFLIGHT	
NA	ALL CHECKLISTS COMPLETED IN ACCORDANCE WITH NATOPS	
403.515	STATIC START DISCUSSION	
403.518	BATTERY START	
403.43	ENGINE FIRE ON THE GROUND	
403.44	MALFUNCTIONS PRIOR TO REFUSAL	
403.45	MALFUNCTIONS AFTER REFUSAL	
403.46	ELECTRICAL BUS FAILURE	
403.49	ENGINE FAILURE IN FLIGHT	
403.411	LOSS OF FLIGHT BOOST PACKAGE	
403.412	PROPELLER OVERSPEED	
403.415	PROPELLER FAILS TO FEATHER	
403.416	PROPELLER WARNING LIGHTS	
403.420	LANDING GEAR EMERGENCIES	
403.52	EMERGENCY DEPRESSURIZATION	
403.510	EMERGENCY BRAKE OPERATION	
403.31	FLUCTUATION RPM	
403.32	FLUCTUATING SHP, TIT, AND FULL FLOW	
403.33	HIGH ENGINE OIL TEMPERATURE	
403.34	LOW ENGINE OIL TEMPERATURE	
403.34	LOW ENGINE OIL PRESSURE	
403.35	TIT OVERTEMPERATURE	
403.36	HOT BRAKE	
403.37	LOW HYDRAULIC FLUID QUANTITY	
403.39	LOW ENGINE OIL QUANTITY	
403.310	CRACKED WINDSHIELD	
403.311	PROPELLER OFFSPEED	
403.312	GENERATOR FAILURE	
403.313	TEMPERATURE DATUM SYSTEM MALFUNCTION	
403.315	FUEL BOOST PUMP FAILURE	
403.316	FUEL TRANSFER PUMP FAILURE	
403.317	ENGINE DRIVEN CENTRIFUGAL BOOST PUMP PRESS LOW LIGHT	
403.318	TACH GENERATOR FAILURE	
403.319	HYDRAULIC SYSTEM FAILURE	

PILOT P3 A/B PPC OFT 5 (CONTINUED)

PQS REF	TASK	COMP
403.320	UNSAFE LANDING GEAR INDICATION	
403.321	NO BETA LIGHT ON LANDING	

COMMENTS: _____

☐ COMPLETE ☐ INCOMPLETE

PILOT NAME: _____ INSTRUCTOR SIGNATURE _____

DATE: _____ OFT HOURS _____

APPENDIX C

PATROL SQUADRON/UNIT SYLLABUS FOR IUT OFT 1

This appendix is a copy of the OFT syllabus from the Patrol Squadron/Unit Training Manual (CNAVRESINST 3500.2A).

INSTRUCTOR PILOT SYLLABUS

IUT-OFT 1 (IUT IN RIGHT SEAT)

		SAT	UNSAT
1.	Annuciator lights	___	___
2.	APU operations/malfunctions	___	___
3.	Battery start	___	___
4.	Start procedures/malfunctions	___	___
5.	Fuel governor, pitchlock reverse horsepower check	___	___
6.	Takeoff procedures	___	___
7.	Eng/prop malfunctions before and after VR	___	___
8.	NTS check	___	___
9.	Prop indexing	___	___
10.	Electrical system/malfunction review	___	___
11.	Hydraulic system/malfunction review	___	___
12.	Prop system/malfunction review	___	___
13.	Fuel system/malfunction review	___	___
14.	Anti/deicing system/malfunction review	___	___
15.	Airconditioning/pressurization system/ malfunction review	___	___

PROSPECTIVE INSTRUCTOR: _____

INSTRUCTOR PILOT: _____

DATE: _____ PILOT TIME: _____ FLIGHT TIME: _____

FLIGHT WAS: SAT _____ UNSAT _____ INCOMPLETE _____

REASON:

REMARKS ON REVERSE

IUT-OFT-1

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